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RECOMMENDED PROCEDURE FOR INSPECTION OF CAST COPPER TUYERES

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Indian Standard

RECOMMENDED PROCEDURE FOR INSPECTION OF CAST COPPER TUYERES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 31 December 1980, after the draft finalized by the Copper and Copper Alloys Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 Copper tuyeres are used in blast furnace because of their unique quality of high thermal conductivity, pressure tightness and castability. Requirements for cast copper tuyere relating to chemical composition, mechanical properties and electrical conductivity have been covered in IS : 8859-1978*. Need was, therefore, felt for a standard which should recommend procedures for inspecting cast copper tuyeres to aid inspectors.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the procedure for inspection of cast copper tuyeres used for blast furnaces in the steel plants.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Cast — A cast is to be taken as one of the following:

a) The product of one furnace melt,

b) The product of one crucible melt,

c) The product of a number of furnace or crucible melts where such are aggregated and mixed prior to sampling.

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*Specification for cast copper tuyere.

†Rules for rounding off numerical values (*revised*).

2.2 Cast Copper Tuyere — Water jacket device cast from copper to the desired shape and size for introducing air blast in blast furnace.

2.3 Supplier — The party supplying the material. The supplier may or may not be the actual manufacturer of the material. The term 'supplier' shall also cover any party with whom the supplier places order for partial compliance.

2.4 Purchaser — The party purchasing the material. The term 'purchaser' shall also cover persons or person expressly authorised in writing by the purchaser to act on his behalf for inspection of the material.

2.5 Material Specification — Unless otherwise stated, this term shall have reference to the Indian standard specification which forms the basis of the contract for the supply of material.

2.6 Certification — Confirmation by the manufacturer or supplier that the material conforms to the requirements of the relevant specification, drawing, order or Inspection Schedule.

2.7 Inspector — The individual responsible for the execution of inspection and release of material.

3. CERTIFICATION

3.1 The manufacturer shall supply to the purchaser necessary certificate in respect of materials governed by this standard and relevant material specification. The supplier's certification shall imply if the material is covered under the ISI Certification Mark.

3.2 If any certificate is issued by the supplier other than the manufacturer, such supplier should hold the equivalent certificate issued by the manufacturer.

4. INSPECTION FACILITIES AND CHECKING EQUIPMENT

4.1 The supplier will make available to the inspector all inspection facilities and inspecting equipments necessary for satisfactorily conducting the inspection methods.

4.2 The purchaser's representative would ensure the accuracy of inspection and checking deviations.

4.3 The supplier should be able to satisfy the purchaser at any reasonable time that any test or measuring equipment used for the purpose of the inspection be specified in the contract is accurate and checked in a planned basis.

NOTE — For details refer to IS : 1387-1967*.

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*General requirements for the supply of metallurgical materials (*first revision*).

5. REPORTS

5.1 The supplier should maintain the inspection records of the routine testing done by him. It should be made available to purchaser's representative on request.

6. NON-CONFORMANCE

6.1 If the non-conformity crops up, such as minor deviations from the material specification or workmanship which means the material is not in accordance with the material specification the purchaser's representative shall have the right to reject the goods.

6.2 Non-conforming materials should be segregated from those found acceptable.

6.3 Repair of non-conforming material should not be undertaken by the supplier without prior approval of the purchaser.

6.4 Repaired goods should be offered for inspection and passed by the nominated person responsible for inspection prior to despatch.

7. MARKS OF IDENTIFICATION

7.1 After passing the casting, inspection stamp which adequately identifies the inspection source, should be put in at any convenient place on the top of the cast tuyere and also on the integral/separate test piece, by the nominated person for inspection. It should be clearly visible and distinct.

7.2 Supplier should give his own identification mark on the front flatface of the tuyere and also on the test piece as agreed between the purchaser and the supplier.

7.3 Tuyere may also have the ISI Certification Mark.

8. RELEASE CERTIFICATE

8.1 A copy of the inspection certificate should accompany each lot/consignment of the casting sent to purchaser by the supplier.

8.2 It should contain the information which would correlate the supplies with purchaser's contract.

9. TESTING

9.1 Visual Test — The cast tuyere should be visually inspected and it should be free from any visual defects, such as slag inclusions, cracks, blow-holes and other harmful defects. Minor defects may be mutually sorted out between the purchaser and the supplier as per their contract. Repairing of minor defects may be allowed as per mutual agreement between the purchaser and the manufacturer.

9.2 Chemical Composition — Chemical composition of the tuyere should conform to IS:8859-1978*. Supplier shall also supply a copy of the relevant analysis, if required.

9.3 Chemical Test — Procedure for chemical analysis should be in accordance with that laid down in IS:440-1964†.

9.4 Mechanical Test — Method of conducting tests should be in accordance with IS:2654-1964‡. Number of test pieces required should be stated clearly in the contract. Test samples shall be separately cast at the same time and from the same melt as the cast tuyere. They shall be cast into the same type of mould used for tuyere.

9.5 Test for Pressure Tightness — The cast tuyere/shell should withstand the hydraulic pressure of 10 kg/cm^2 for 10 minutes without any leakage or sweating. During testing the cast structure may be tapped gently by a wooden mallet as specified in IS:8859-1978*. Inspection should be carried out in presence of the nominated person of the supplier as agreed to by the purchaser.

9.6 Electrical Conductivity/Resistivity — Electrical conductivity shall be determined, if mentioned in the contract from the cast as in IS:434 (Part I)-1964§ and specified in IS:8859-1978*. The length of the test casting should be sufficient to give the accuracy required. Conductivity should be 80 percent, *Min* of IACS, or as agreed upon between the supplier and the purchaser.

10. DIMENSIONAL TOLERANCE

10.1 The dimensions of the castings and their tolerance limits shall conform to IS:2102-1969||.

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*Specification for cast copper tuyere.

†Methods of chemical analysis of copper (*revised*).

‡Method for tensile testing of copper and copper alloys.

§Specification for rubber insulated cables: Part I With copper conductors (*revised*).

||Allowable deviations for dimensions without specified tolerances (*first revision*).

INDIAN STANDARDS
ON
COPPER AND COPPER ALLOYS

IS:

28-1975	Phosphor bronze ingots and castings (*third revision*)
191 Parts I to XI 1980	Specification for copper (*third revision*)
288-1960	Copper rods for boiler stay bolts and rivets (*revised*)
291-1977	Naval brass rods and sections (suitable for machining and forging) (*second revision*)
292-1961	Brass ingots and castings (*revised*)
304-1961	High tensile brass ingots and castings (*revised*)
305-1961	Aluminium bronze ingots and castings (*revised*)
306-1968	Tin bronze ingots and castings (*second revision*)
318-1962	Leaded tin bronze ingots and castings (*revised*)
319-1974	Free-cutting brass bars rods and sections (*third revision*)
320-1980	High tensile brass rods and sections (*second revision*)
407-1968	Brass tubes for general purposes (*second revision*)
410-1977	Rolled brass, sheet, strip and foil (*second revision*)
422-1967	Brass sheet and strip for the manufacture of utensiles (*first revision*)
531-1971	Leaded brass strip for instruments parts (*first revision*)
613-1964	Copper rods for electrical purposes (*revised*)
1028-1970	Silicon bronze ingots and castings (*first revision*)
1264-1965	Brass ingots for gravity die castings and brass gravity die casting (including naval brass) (*revised*)
1408-1968	Recommended procedure for inspection of copper-base alloy sand castings (*first revision*)
1458-1965	Railway bronze ingots and castings (*revised*)
1545-1969	Solid drawn copper alloy tubes (*first revision*)
1550-1967	Copper sheet and strip for utensils and for general purposes (*first revision*)
1897-1971	Copper strip for electrical purposes (*first revision*)
1972-1977	Copper plate, sheet and strip for industrial purposes (*first revision*)
2283-1962	Nickel silver sheet and strip for general purposes
2451-1963	Nickel silver ingots and casting for cutlery and hollow-ware
2456-1963	Brass strip for pen nibs
2501-1972	Copper tubes for general engineering purposes (*first revision*)
2704-1964	Brass wire for cold-headed and machined parts
2768-1964	Gilding metal strip for bullet envelope
2826-1980	Dimensions for wrought copper and copper alloy rods and bars (*second revision*)
3051-1965	Dimensions for wrought copper and copper alloys plate
3052-1974	Dimensions for wrought copper and copper alloys, sheet, strip and foil (*first revision*)
3057-1965	Copper sheets for photo process engravings
3091-1965	Aluminium bronze ingots and castings for overhead fittings in electrical traction
3167-1965	Cap copper alloy strip

3168-1965	Brass strip and foil for deep drawing
3288 (Part I)-1973	Glossary of terms for copper and copper alloys: Part I Cast form and wrought form (main types) (*first revision*)
3331-1977	Copper and brass strip/foil for radiator cores (*first revision*)
3332-1965	Nickel silver sheet and strip for telecommunication purposes
3487-1966	Copper strip and for foil manufacture of copper gaskets and copper washers and eyelets
3488-1966	Brass bars, rods and sections suitable for forgings
4076-1967	Hard brass wires for springs and other special purposes
4131-1967	Nickel-copper alloy castings
4170-1967	Brass rods for general engineering purposes
4171-1967	Copper rods for general engineering purposes
4412-1967	Copper wires for general engineering purposes
4413-1967	Brass wires for general engineering purposes
4519-1967	Dimensions for copper commutator bars
5053-1969	Dimensions for wrought copper and copper alloy rods for fasteners
5493-1969	Dimensions for wrought copper and copper alloys tubes
5494-1969	Leaded brass sheets and strips for use in the manufacture of tubewell strainers
5743-1970	Copper master alloys
5744-1970	Copper alloy screwed ferrules for condenser, evaporators, heater and cooler rubes
5885-1977	Copper commutator bar (*first revision*)
6912-1973	Copper and copper alloy forgings
7608-1975	Phosphor bronze wires (for general engineering purposes)
7811-1975	Phosphor bronze rods and bars
7814-1975	Phosphor bronze sheet, strip and foil
8328-1977	Free cutting copper bars, rods and sections
8362-1977	Copper and copper alloy rolled plates for condensers and heat exchanges
8364-1977	Free cutting brass wire
8365-1977	Cadmium copper and chromium copper electrodes
8631-1977	Copper base alloys used for marine propellers
8859-1978	Cast copper tuyere